ECOfOCUS
CARY INSTITUTE OF ECOSYSTEM STUDIES
The science behind environmental solutions
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National Climate Assessment

CARY INSTITUTE SCIENTISTS HELP LEAD THE NATIONAL CLIMATE ASSESSMENT

by Sian M. Hunter

On January 14, a week before President Obama said Americans must respond to climate change in his inauguration speech, a draft of the 2013 National Climate Assessment (NCA) was released.

Four years in the making, the comprehensive analysis summarizes current global change trends and makes predictions for the coming years. Three members of the Cary Institute's community played a leadership role in the report's creation.

Jerry Melillo, vice-chair of the Cary Institute Board of Trustees and senior scientist at the Marine Biological Laboratory of Woods Hole, spearheads the effort as chair of the National Climate Assessment and Development Advisory Committee. Cary Institute President William Schlesinger and microbial ecologist Peter Groffman led sections on biogeochemistry and ecology respectively.

The Global Change Research Act of 1990 requires periodic National Climate Assessment (NCA) reports to analyze the effects of global change on the environment, agriculture, energy production and use, land and water resources, transportation, human health, and biological diversity.

The report's goal is to inform policy decisions and educate citizens about climate change impacts.

“The NCA helps us see if predictions made over time have come to pass and lets us learn from what we didn't get right,” notes Groffman. New perspectives, gained by incorporating refinements from earlier editions, Groffman says, make the NCA critically valuable to the scientific community.

Groffman's section focused on ecosystems, ecosystem services, and biodiversity, with participants analyzing phenomena ranging from species loss to changes in the arrival of spring and fall. Synthesizing research from hundreds of documents, testing predictions, and refining current knowledge “offers a more robust assessment, which will ultimately lead to better decision making,” states Groffman.

Schlesinger, who led the group on biogeochemical cycles, recognizes that some refinements in his section may not sit well with various stakeholders. “Previously, some scientists thought that upwards of 35% of carbon dioxide emissions were being absorbed by North American forests. Current findings indicate that 24% is the high bar, and 13% is more accurate.”

> “The robust National Climate Assessment will ultimately lead to better decision making.”

His section confirms that CO_2 emissions from fossil-fuel use continue to be the major driver of climate change. It also notes that estimates of human-derived nitrogen emissions have nearly doubled.

The nitrogen cycle's influence on climate change is complex. Nitrogen gases and aerosols in the atmosphere may be moderating climate warming at present, but the increasing use of nitrogen fertilizers is likely to enhance greenhouse warming over the next 100 years.

Under Melillo's guidance, an important feature distinguishing this NCA report from prior editions is input from both public and private sectors. That the foundation of the 2013 report is built on partnerships among the government, academics, and industry may enhance meaningful integration into policy decisions.

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ECOfOCUS

Ecofocus is published by the Cary Institute of Ecosystem Studies. Our scientists are leading efforts to understand human impacts on air and water quality, climate change, invasive species, and the ecological dimensions of infectious disease. As an independent, not-for-profit organization, the Cary Institute produces unbiased research that leads to more effective management and policy decisions.

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FROM OUR PRESIDENT

John Halpern

Our daily radio show Earth Wise continues to air on WAMC Northeast Public Radio and ten partner stations located throughout the nation.

Dear Friends of the Cary Institute:

The inauguration of President Obama in late January, and his public emphasis on tackling climate change, brought new urgency to the scientific work at the Cary Institute. Several of our scientists are authors of chapters in the new National Climate Assessment, which will guide policy makers and elected officials to understand the magnitude and mitigation options for climate change impacts in the United States.

Meanwhile, during the first two weeks of January, we hosted 18 graduate students in our annual class, Fundamentals of Ecosystem Ecology. Coordinated by Clive Jones, this year's offerings covered the essentials of energy flow and nutrient cycling in terrestrial and aquatic habitats, global biogeochemical cycles, and indications of stress in natural ecosystems. We had a special session to discuss the issues surrounding natural-gas extraction by hydraulic fracturing in New York and across the country. New low-priced sources of natural gas are certain to redraw the map of alternative energy to combat climate change.

The new year also brought recognition of past accomplishments to a number of the scientists on the staff at Cary Institute—especially to Gary Lovett, who was elected as a fellow of the American Association of the Advancement of Science (AAAS) and is the seventh Institute scientist to join those ranks.

Meanwhile, our daily radio show Earth Wise continues to air on WAMC Northeast Public Radio and ten partner stations located throughout the nation. The show's goal: translating environmental science to broader public audiences, including residents of the Hudson Valley.

Join us for a Friday Night at Cary Institute lecture sometime soon—we have a number of engaging events on the spring schedule. You can help keep these programs vital by joining our Aldo Leopold Society, whose supporters strengthen our research and outreach efforts.

A special thank you goes out to Aldo Leopold Society member Mary Moeller for her generosity in starting off our campaign to secure a new boat for our Hudson River work.

Dr. William H. Schlesinger, President

ENGAGING CITIZENS IN SCIENCE

by Sian M. Hunter

From time to time, we can all use an extra hand. When it comes to data collection, scientists sometimes wish for 20, 200, even 2000 extra hands. Cary Institute staff members have developed a range of citizen-science initiatives in which benefits flow equally between researchers and volunteers.

Emerich AmRhein

EYES ON THE HUDSON RIVER

Since 2003, aquatic ecologist Stuart Findlay has solicited volunteers to monitor submerged aquatic vegetation in the Hudson River, as part of his research to understand the ecological functions of these plants. "We obtain aerial photographs of the Hudson every five years, but annual data gathered by citizens provide critical information on year-to-year changes that we otherwise would not have," Findlay notes.

Working independently in teams of two, Findlay's volunteers strike out in kayaks and canoes to monitor the coverage and water depth of plants at more than 200 points in the river. Findlay plans three yearly meetings—a spring orientation to brief newcomers and review the past year's findings, a July training to teach GPS use and data entry, and an October appreciation dinner to summarize the year's work.

Training volunteers, Findlay notes, is a critical part of ensuring the quality of data gathered by amateurs, but it also provides an opportunity for scientists to translate their research to the public and for the volunteers to gain scientific knowledge and build camaraderie.

STUDENTS AS STREAM MONITORS

This spring, the Cary Institute education team will debut a long-term stream ecology initiative that involves students in data collection. The Young Environmental Scientist Network (YES-Net) will enlist middle-school teachers and their students to investigate how environmental conditions affect when stream insects, such as mayflies and stoneflies, change from their larval stage to adult stage and leave the stream.

"Hands-on activities generate excitement for young students," says educator Jennifer Rubbo, "but studies show that lack of familiarity or comfort with data is a barrier to science literacy in older students." YES-Net includes a summer training program for teachers in data collection and analysis. And the project will also host a database that will let students compare data from their stream site with others in the network.

Participatory research gives kids a chance to do real scientific work. By observing changes in emergence patterns, and thinking about how stream insects provide food for other species like birds, students also learn big-picture concepts like biodiversity. "Citizen-science gives students a chance to engage meaningfully with science at an early age, but we get something too—we learn more about what teaching methods work well with kids," Rubbo comments.

TACKLING URBAN MOSQUITOES

By engaging residents of urban Baltimore in her mosquito research, community ecologist Shannon LaDeau will test a similar feedback loop in her studies of West Nile virus. LaDeau and colleagues will train citizens to rate features of city blocks that affect mosquito habitat. They will also seek citizen participation via questionnaires, journals, and photography to assess resident's knowledge of and attitudes toward urban pests.

"Passive public-health campaigns haven't always been effective in educating or motivating citizens," says LaDeau. "With this citizen-science segment, we're not only obtaining data on factors that contribute to mosquito-borne disease risk, we're also testing the theory that participation itself may improve residents' sense of empowerment and follow-through action."

To learn more about citizen science, including benefits gained by scientists and volunteers, consider attending our May 3 public lecture by Akiko Busch. She will discuss her new book, *The Incidental Steward: Reflections on Citizen Science*. Learn more at: www.caryinstitute.org/events.

SPOTLIGHTS

STAFF DISTINCTIONS

Gary Lovett has been elected as Fellow to the American Association for the Advancement of Science in recognition of his seminal work in dry deposition to forest canopies and his studies of the impacts of acid deposition, excess nitrogen, pests, and pathogens on forests.

Alan Berkowitz and **William Schlesinger** have been elected as Fellows to the Ecological Society of America in recognition of their distinguished contributions to the advancement and application of ecological knowledge.

Emma Rosi-Marshall will be the next Director of the Baltimore Ecosystem Study Long-Term Ecological Research project, a role that is targeted to begin in 2016.

William Schlesinger has been tapped as Chair-Elect of the Section on Geology and Geography for the American Association of the Advancement of Science. The three-year commitment includes successive years as Chair and Retiring Chair.

Charles Canham has been elected to a second three-year term as secretary and member of the governing board of the Ecological Society of America.

THE NEWSLETTER IS AVAILABLE ONLINE

The Cary Institute's newsletter is available on our website at www.caryinstitute.org/newsroom/ecofocus-newsletter. If you would prefer to read the newsletter online instead of receiving a printed copy by mail please notify us at freemanp@caryinstitute.org.

GORDON AND BETTY MOORE FOUNDATION

In north-central Chile, in the middle of a desert, there is a mountain forest dense with trees, ferns, and mosses. Its lush greenery is fed by fog blowing off the nearby Pacific Ocean.

Unlike rain, fog can move horizontally through the landscape, delivering water and essential plant nutrients. But fog can also be a source of pollution, from undesirable microbes to acidic chemicals.

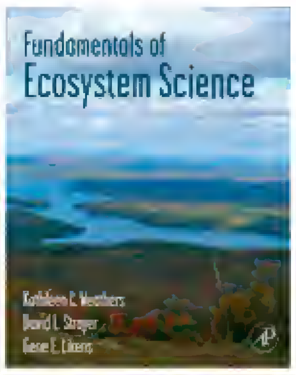
In an effort to better understand the role that fog plays in ecosystems, Cary Institute biogeochemist Kathleen Weathers will be leading the first-ever gathering of scientists who study fog. The event has been made possible by a $157,000 grant from the Gordon and Betty Moore Foundation.

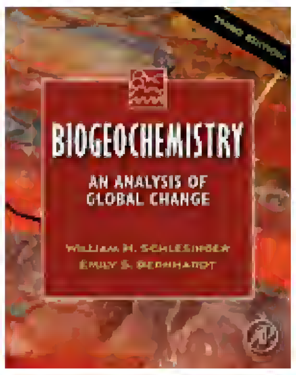
The workshop will be held this June at the Moore Foundation's headquarters on the northern coast of California. More than 30 scientists from diverse fields will attend, including oceanographers, atmospheric scientists, botanists, and philosophers. Together they will explore what we know, don't know, and need to know about how fog shapes the environment.

Findings will be communicated in a paper that addresses knowledge gaps, such as how fog delivers chemicals, microbes, and water to the land. An equally important outcome of the workshop will be new collaborations forged among researchers.

NEW PUBLICATIONS

Two books by Cary Institute scientists were released this winter. *Fundamentals of Ecosystem Science* (Academic Press, December 2012), edited by Kathleen Weathers, David Strayer, and Gene Likens, offers a comprehensive introduction to the field. William Schlesinger and Emily Bernhardt of Duke University produced a thoroughly revised and updated third edition of the textbook, *Biochemistry: An Analysis of Global Change* (Academic Press, January 2013).





WRITER IN RESIDENCE KATHERINE LARSEN

Paul Hoppe

This May, poet and author Katherine Larson will join the Cary Institute community as the newest writer-in-residence. In addition to having won a number of awards and fellowships for her writing, Larson, who lives in Arizona, is also a research scientist in molecular biology. Her poems connect the empirical world to the imaginative, exploring creative and destructive moments in micro- and macro-environments.

NOTES FROM THE FIELD: HURRICANE SANDY PASSES THROUGH MILLBROOK

The Cary Institute's Environmental Monitoring Station has collected weather data continuously since 1988. Its instruments track air pollution, precipitation patterns, and solar radiation, among other things. These measurements are essential to evaluating the impacts of climate change and the success of pollution control measures. They also provide a window into powerful storm systems, like Hurricane Sandy.

The conditions Hudson Valley citizens experienced as Sandy approached on October 29th were recorded in precise detail by our Environmental Monitoring Station. Victoria Kelly, the station's manager, noted that the relationship between wind direction and barometric pressure was particularly dynamic.

At about 1 a.m. on the 29th, wind blew steadily from the north-northeast at approximately 10 mph; at the same time the barometric pressure began falling. The eye of the storm was closest to Millbrook between 6 p.m. and 7 p.m., when the eye moved over Atlantic City, some 200 miles to the south. In that short time frame, the wind dropped and changed direction, and the lowest barometric pressure readings were recorded.

“If you look at the satellite photo of the storm, you can see that the wind is from the north-northeast before the eye wall passes by, and then from the southeast afterward,” Kelly commented. “The wind direction switches almost exactly when the barometric pressure hit bottom.”

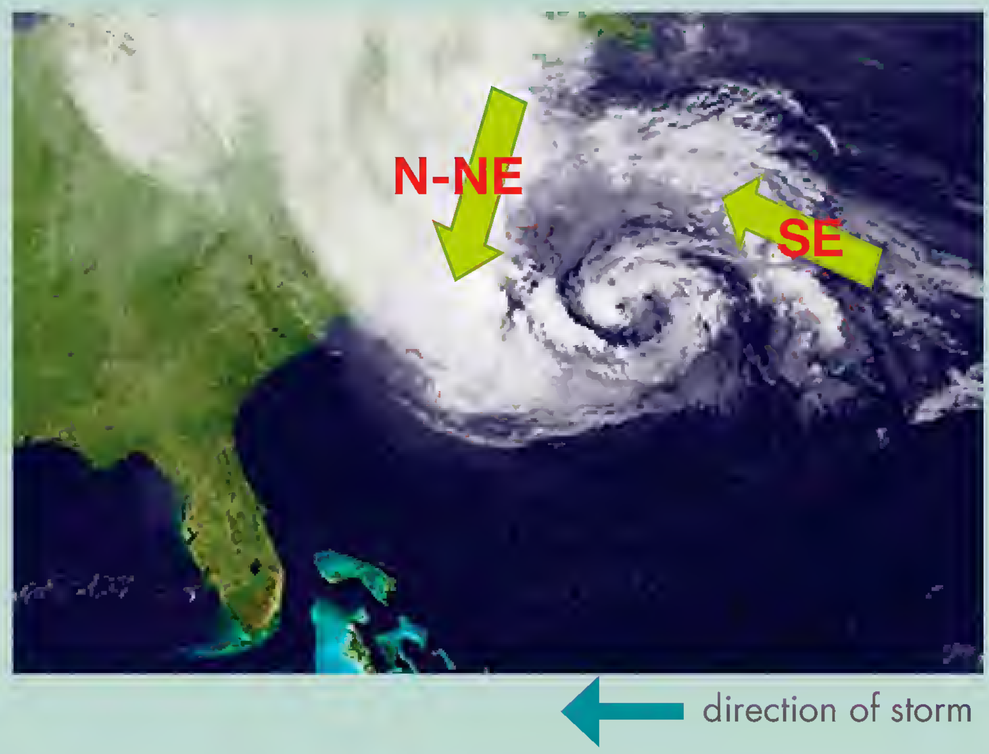
Those venturing outside at this time may have noticed a period of warmer, more humid weather as a result of those southeasterly winds. And as the eye of the storm moved away, residents might have felt or heard Sandy's major gusts. The strongest winds measured on our campus were 52 mph at 8:27 p.m.

Although the storm’s eye didn't pass directly over Millbrook, the area experienced a typical pattern of increased winds from the backside of the storm. “The most surprising aspect of Sandy was the small amount of rainfall we received—only 0.43 inch of rain, which was far less than was forecast for the area,” comments Kelly. “Because of the way the storm tracked, we were relatively spared.”

Happily, Kelly did not have to don foul-weather gear to take readings. Thanks to data feeds from state-of-the-art remote sensors, she was able to access storm measurements safely from her home computer.

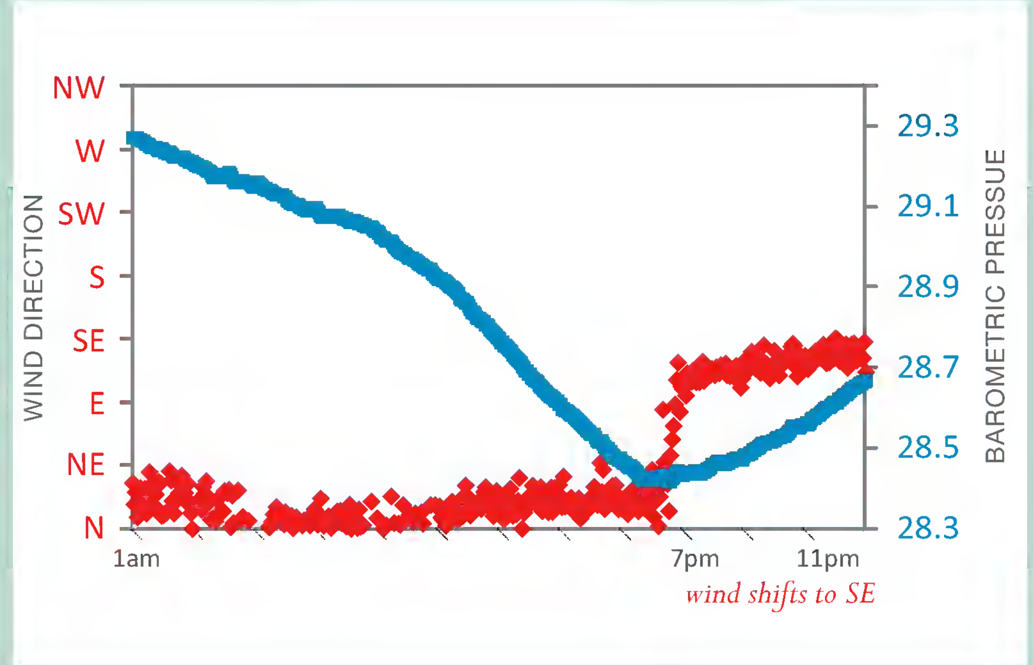
To view the array of conditions captured by our Environmental Monitoring Station, visit: www.caryinstitute.org/science-program/research-projects/environmental-monitoring-program.

Wind direction



From the satellite photo of the storm, you can see wind is from the north-northeast before the eye passes over and from the southeast after the eye passes over.

Wind direction and barometric pressure



SUPPORTERS' CORNER

ALDO LEOPOLD SOCIETY AUTUMN CELEBRATION

In appreciation of the Cary Institute's most loyal donors, Irene and Jack Banning hosted the Aldo Leopold Society's annual *Autumn Celebration* at Black Sheep Hill in Pine Plains on October 13, 2012. The evening began with a scenic trek up their torch-lit driveway past rustic sculptures, the farm train station, sheep meadows, and barns to a cocktail reception in the Banning's home. More than 75 members of the Aldo Leopold Society were treated to a roaring fire on the patio and local fare prepared by Pine Plains Platter. With a spectacular sunset underway, President Bill Schlesinger offered welcoming remarks, along with updates on the Institute's recent accomplishments, and introduced the Cary Institute's core scientific staff. On behalf of the Board of Trustees, Irene Banning thanked members of the Society for their generous contributions that support the Institute's expanded outreach and education programs, and world-renowned environmental research programs.

Vicki Doyle

David Greenwood and Laureen Knutsen

Vicki Doyle

Charlie Weeden and Bill Schlesinger

TVicki Doyle

Ngaire Anderson, Tom Bieler, and Stephen Kaye

Vicki Doyle

Karen Klopp and Jack Banning

Vicki Doyle

Caddie and Tim Eland, Irene Banning, and Paula Redmond

Vicki Doyle

Dick Dunham, Susan Burks, Judy Benardete, and Joan Dunham

Vicki Doyle

Hank Meirowitz and Eve Propp

CALENDAR

Upcoming Public Programs

Our Public Programs are a great way to expand your ecological understanding while learning about issues facing the environment. Lectures are held in our auditorium, located at 2801 Sharon Tpk., (Rte. 44) in Millbrook, NY. Registration is required for outdoor events. For more information call (845) 677-7600 x 121 or e-mail freemanp@caryinstitute.org.

Friday, March 29 at 7 p.m.
The Water We Drink
James Salzman, Duke University Professor of Environmental Policy, will talk about his new book, *Drinking Water*, examining the history and science of water—a basic human need. Doors open at 6:30 p.m. Seating is first come first served.

Saturday, April 6 at 9 a.m. - 3 p.m.
Woodland Pool Identification and Assessment Workshop
Mike Rubbo, Director of the Teatown Lake Reservation, will lead a workshop for municipal officials and professional biologists who want to gain experience identifying and assessing woodland pools. Participants will use satellite images to identify pools remotely. Conservation methods will be discussed. Register online at http://woodlandpool.eventbrite.com.

Sunday, April 7 at 1 p.m.
Spring Amphibian Egg Hunt
Join our educators for a hike on the Cary Institute's grounds. Explore vernal pools and discover early spring life while searching for amphibian egg masses. Space is limited. Register online at http://amphibianwalk.eventbrite.com.

Friday, April 19 at 7 p.m.
Overfishing: What Everyone Needs to Know
Ned Ames Honorary Lecture. Fisheries expert Ray Hilborn, from the University of Washington, will talk about the exploitation of the world's fish stocks, why traditional approaches to fisheries management have failed, and the need for radical new solutions. Doors open at 6:30 p.m. Seating is first come first served.

Scientific Seminar Series

Free and open to the public, our scientific seminars are held on Thursdays at 11 a.m. in the Cary Institute's auditorium. A sampling of offerings is below; a complete list is available online at www.caryinstitute.org.

March 7: The Acadia Learning Data Literacy Project: A Framework for Using Data in Science Classrooms. Dr. Molly Schaeffer, University of Maine.

March 14: Fertilizer and the New African Green Revolution: Implications for Greenhouse Gas Emissions and Pollution Precursors, Dr. Jonathan Hickman, Columbia University.

March 21: Transport, Fate, Impacts, and Implications of Manufactured Nanomaterials in Terrestrial and Aquatic Ecosystems. Dr. Benjamin Colman, Duke University.

For a complete listing of upcoming events, programs, and videos of past programs visit our website at www.caryinstitute.org/events.html.

Ways to Support the Cary Institute

Supporters receive an *Ecofocus* subscription and e-mail notification of lectures and events. **Aldo Leopold Society Members** are a special part of the Cary Institute family. Exclusive privileges include access to invitation-only trips, receptions, science updates, and reserved seating at our evening lectures.

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CARY INSTITUTE SUMMER CAMP 2013
JOURNEY THROUGH THE CYCLES OF LIFE

The theme for 2013 Summer Ecology Camp is "Journey through the Cycles of Life." While exploring the hills, valleys, ponds, and streams of our 2,000-acre campus, campers will conduct scientific investigations, learn about local natural history, and participate in team building activities.

Lessons will incorporate observing how organisms change as they grow, investigating the connections organisms have with their environment, and witnessing how they interact with other living things.

Weekly sessions are limited to a maximum of 12 campers and are dedicated to either younger campers (grades 2-4) or older campers (grades 5-7). A special two-week session will be offered for older youth (grades 8-10), where they have the opportunity to conduct their own ecological research.

Junior counselor positions will be offered for students entering grades 8-12. More information and applications are available online at www.caryinstitute.org or by calling (845) 677-5343.

Jen Rubbo

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